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V

THE KELP-FLIES OF NORTH AMERICA
(GENUS FUCELLIA, FAMILY ANTHOMYIDÆ)

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The genus *Fucellia* was established in 1841 by Robineau-Desvoidy (Annales Soc. Ent. France, x, 269), with the single species *arenaria*. The type specimens are lost, and the description contains at least two palpable blunders; but from the account of the habits of the adult on the French coast, it is undoubtedly identical with Haliday's *Halithea maritima*, published in 1838 (Annals Nat. Hist., ii, 186). The generic name *Halithea* is preoccupied, so *maritima* becomes the type of *Fucellia*, and is so given by Coquillett (Type-Species, 1910, 545).

The species of *Fucellia* live in the larval stage in brown seaweeds (kelp, *Fucus*, etc.), cast up by the waves along ocean beaches; the adults can be found all summer long on these masses, often in immense numbers. Only *maritima* and *fucorum* have been reported at any distance inland; their larval habits in these situations are unknown.

Stein has published an excellent monograph of the species of the world, 14 in number, in Wiener Ent. Zeitung, xxix,

September 16, 1918



11-27, January, 1910. Johnson closely followed this with a review of the species of our Atlantic coast and Greenland, four in number, in *Psyche*, xvii, 76-78; April, 1910. As the rich fauna of our west coast was only partly known to Stein, and as his paper is not very accessible, I offer a new treatment of our species, both east and west.

Generic characters.—*Maritima* shows the following characters in both sexes: front wider than one eye; a single large pair of cruciate bristles on the front; fronto-orbitals 6 in a single row, the upper 3 somewhat outcurved, the lower incurved; verticals two pairs; ocellars large, two smaller pairs behind the triangle; parafacials narrow, bare; antennæ short, with bare arista; eye small, bulging, bare, nearly round; bucca fully one-half the eye-height, bare except a single row of bristles below; epistoma slightly produced, vibrissæ above the lower edge of head, only a single small bristle above them; palpi ordinary; proboscis short, with a pair of long hairs below beyond the elbow; labella ordinary; back of head bulging, with sparse hairs. Thoracic chætotaxy¹: postsutural dorsocentrals 3 (a rather large hair behind the third), anterior dorsocentrals 2, humeral 2 or 3, interhumeral 1, presutural 1, notopleural 2, intraalar 2, supraalar 1, a small prealar, postalar 2 (the hind one very large), anterior acrostichal 3 pairs rather large and no small hairs, posterior acrostichal 5 or 6 small pairs and 1 larger prescutellar, sternopleural 2 in front and 2 behind, prothoracic 1, mesopleural 5 behind and 1 at front lower corner; scutellum bare below with 1 marginal near base, 1 pair long apical close together, 1 smaller discal, the disk without hairs except at sides; pteropleura and metapleura bare. Front calypter projecting far beyond the reduced hind one. Hind tibia with a row of 3 or 4 erect bristles on the extensor side, the lowest subapical. Venation ordinary, costal spine present, third and fourth veins parallel, ant cv at middle of wing, the cross-veins separated by almost the length of the last segment of the fourth; last segment of fifth short, sixth slender but reaching the margin; costa setulose.

In listing the preceding characters, it is not intended to intimate that a species must have them all in order to be con-

¹The names of the thoracic bristles are given in full here, but are generally abbreviated farther on; they are explained in Williston's *Manual*, my *Sarcophaga* and *Allies*, also in a valuable and easily accessible paper by Walton, *Ent. News*, xx, 307-314.

generic with *maritima*; for instance, in the known species the costal setules may be much larger than in *maritima* (*costalis*) or absent (*evermanni*); the lower hind stpl may be absent (*bicrucata* and *evermanni*); a few very minute hairs may occur underneath the scutellum (in some but not all specimens of *separata*, *costalis*, and *fucorum*); and so on. The head structure, venation, and chætotaxy, however, vary but little, and the group is decidedly homogeneous, although the species are easily separated.

Down to 1893, the genus had been uniformly referred to the family Scatophagidæ (or Scatomyzidæ), so far as I have been able to trace its history. In the year mentioned, Girschner (Berl. Ent. Zeitsch., xxxviii, 304) referred it to Cœnosiinæ; but as he included *Scatophaga*, *Cordylura*, etc., in the same group, this has not much significance. Becker (ibid., xxxix, 80) in the following year first definitely separated the Fucelliinæ from *Scatophaga* and its allies. "They are," he wrote, "Anthomyids, clearly excluded from this family by having a four-segmented abdomen, cruciate frontal bristles, and a pair of costal spines at the end of the auxiliary vein." Stein accepted this disposition of them in the Palæarctic Catalogue (1908), where they stand as a subfamily, Fucelliinæ containing but the one genus.

Malloch, in a recent analysis of Anthomyid subfamilies (Canadian Ent., xlix, 408; Dec., 1917) separates Fucelliinæ from Cœnosiinæ in the possession by the former of cruciate frontal bristles and a spine below on the hind basitarsus, the sternopleurals being never in the form of an equilateral triangle.

Schnabl and Dziedzicki, Die Anthomyiden, 1911, p. 123, proposed the genus *Fucellina* for *Fucellia griseola* Fall., *signata* Zett., and *picipennis* Beck. The principal character is that the fronto-orbital bristles are single-rowed in *Fucellina*, and double-rowed in *Fucellia*. This I must regard as purely a mistake, as they are single-rowed in all that I know. Several other characters are mentioned, but they do not remain grouped in our species, but split in all directions. Hence *Fucellina* appears to be only another in the long list of unsuccessful attempts to improve Anthomyid genera.

TABLES OF SPECIES

MALES

1. Femora largely yellow (Southern California) *rejecta*, new species
Femora black 2
2. Front with two or three pairs of cruciate bristles..... 3
Front with a single pair 4
3. Front with three pairs, the lower farther apart; ant acr with scattered minute hairs between (Bering Straits).....
..... *bicrucciata* Stein.
Front with two pairs, the lower farther apart, ant acr without scattered minute hairs (California).... *evermanni*, new species
4. Hind femora beneath at extreme base with a tuft of short spines.. 5
Hind femora plain 7
5. Middle tibiæ on inner front side with one or two distinct bristles 6
Middle tibiæ without bristles on inner front side (Atlantic coast; Europe) *maritima* Hal.
6. Hind femur at base close to the tuft of bristles with a knoblike protuberance turned toward the body, which is also beset with short spines (Greenland to Bering Straits, and down the Pacific coast; Europe) *fucorum* Fall.
Hind femur with only the tuft 6½
- 6½. Head square in profile, the front flattened, protuberant anteriorly (Greenland; Arctic North America).... *ariciiformis* Holmg.
Head globular, front as usual; front of wing clouded beyond middle (Kodiak Island, Alaska)..... *hinei*, new species
7. With a large dark spot in apical half of wing (Greenland; Arctic North America) *pictipennis* Beck.
Wing unspotted. 8
8. Middle femur with stout bristles below, which on the apical half are short and comblike; costa with long spines (California)....
..... *costalis* Stein.
- Middle femora without such bristles, costa with short spines .. 9
9. Hind femora beneath on apical half with a close-set row of about 14 slanting bristles (Alaska) *antennata* Stein.
Hind femora with only three to five bristles beneath 10
10. Prealar absent, bucca as high as eye (California).... *separata* Stein.
Prealar present, bucca not so high 11
11. Tibiæ red, hind ones with only two or three bristles on outer front side (California; Washington)..... *rufitibia* Stein.
Tibiæ black, hind ones on outer front side with a row of about 8, the upper small (British Columbia).... *astuum*, new species

FEMALES

1. Femora yellow (Southern California) *rejecta*, new species
Femora black 2
2. Front with two or three pairs of cruciate bristles 3
Front with a single pair 4

DESCRIPTION OF THE SPECIES

1. *Fucellia maritima* Hal.

(Figs. 1, 2, 3)

Haliday, Annals of Natural Hist., ii, 186, 1838 (*Halithca*).—Europe.

Macquart, Annales Soc. Ent. France, vii, 424, 1838 or 1839 (*Scatophaga marina*).—Europe.

Robineau-Desvoidy, *ibid*, x, 272 (*arenaria*).—Europe.

Lundbeck, Dipt. Grœnl., ii, (Vidensk. Meddel., 1900) 291, f. lb. (*intermedia*).—Greenland. [Stein.]

Stein, Wien. Ent. Zeit., xxix, 1910, 18.—Entire European coast, North Africa, North and South America on Atlantic side; sometimes inland (Genthin and Berlin); seems unknown from shores of Pacific.

Johnson, Psyche, xvii, 1910, 77 (*marina*).—Labrador to Florida.

Winn and Beaulieu, List of Quebec Diptera, 1915, oc. at East Bolton, Que.

Johnson made *marina* prior, but accepted the date of the séance as the date of publication.

In addition to the characters listed as generic, the species shows the following (in both sexes unless the contrary is indicated): General color brown-gray, pollinose; front red in middle, yellow toward antennæ, brown at vertex; a circle of pale pollen, interrupted behind, around the ocellar prominence; gena and bucca brown in ground color; palpi yellow; tips brownish; proboscis blackish; antennæ black, second joint sometimes brown, over half as long as third; arista straight, short, thickened for 2-5 its length. Thorax indistinctly brown above; humerus dark brown on the side, below which the pollen suddenly becomes whitish, making a pale spot which includes the lower half of the spiracle; mesopleura hairy on less than the upper-posterior half; calypters pale yellow, rim and its hairs the same; halteres yellow.

Abdomen tessellated, opaque brown-gray; in the male the first segment is longest, in the female the fourth; the male has a small and retracted hypopygium, the fifth sternite with a broad emargination behind and a narrow lobe each side. Coxæ, femora, and tarsi black, the trochanters and tibiæ yellow; front tibiæ with two small setæ on outer hind side; middle tibia with one on outer front, three small on outer hind side; hind femur with an upper-outer row of bristles double toward tip, and a sparse row below that begins about the middle; in the male there is at base below a protuberance against which the tip of the tibia closes, which bears a bunch of black spines. Hind tibia with the row behind as already mentioned, three on outer hind side, four on outer front side. Hind basitarsus with spine below. Pulvilli short, the front ones a little elongated in the male.

Wing hyaline or very slightly grayish, veins brown to yellow; setule on costa beginning before the tip of auxiliary and extending nearly to tip of second, but not very large.

Length 5 to 5½ mm.

NOTE—The figures in this paper are not drawn to a uniform scale. Wings and profiles were made with camera lucida.

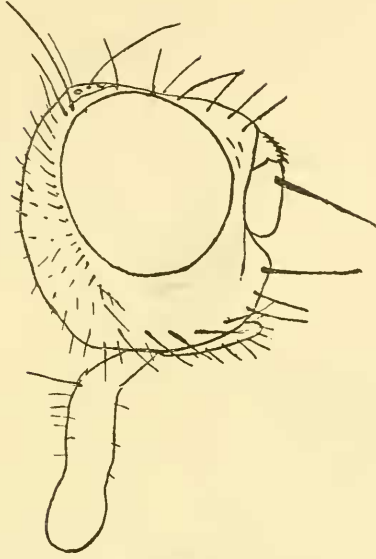


Fig. 1. *Fucellia maritima*, head in profile, male.

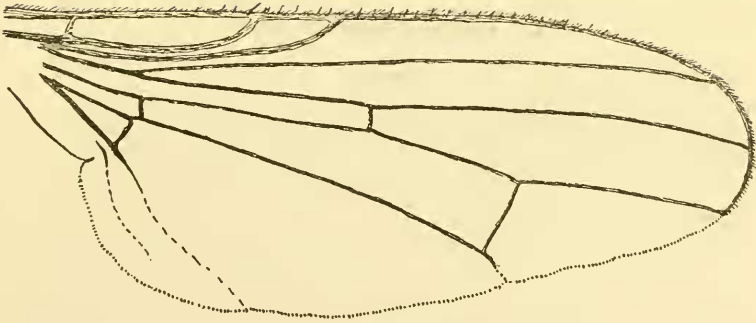


Fig. 2. *Fucellia maritima*, wing.

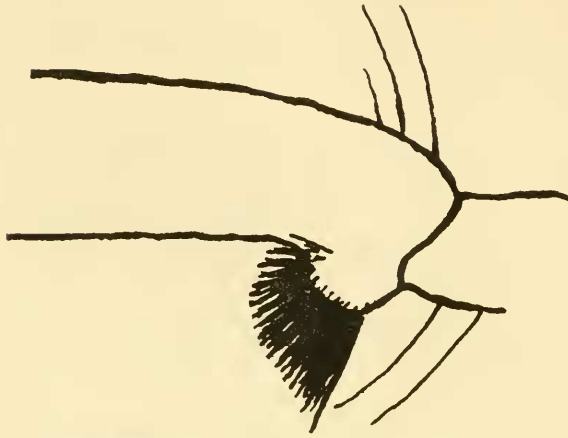


Fig. 3. *Fucellia maritima*, inner side of base of hind femur, male.

Eleven specimens, both sexes; one pair European without locality, determined as *fucorum* by Strobl many years ago; seven from New Bedford, Mass., determined as *fucorum* by Stein in 1897; one from Woods Hole, Mass.; one from Falls Church, Va., collected by Nathan Banks. I have determined and returned other Atlantic coast specimens of this common species, without making a note of the localities². Mr. Malloch informs me that he has taken the species in southern Illinois.

2. *Fucellia fucorum* Fall.

(Fig. 4)

Fallen, Scatomyzides, 5, 1819 (*Scatomyza*).—Europe.

Meigen, Syst. Besch., v, 253, 1826 (*Scatophaga*).

Curtis, Insects of Ross's Polar Exped., 1831, lxxx, oc. in Arctic America (*Scatophaga*).

Macquart, Hist. Nat. Dipt., ii, 395 (*Scatophaga*), 1835.

Haliday, Annals Nat. Hist., ii, 186 (*Halithea*), 1835.

² In the Osten Sacken material in the Museum of Comparative Zoology are a pair of *maritima* labeled "S. Barbara. O. Sacken," evidently indicating Santa Barbara, Cal., as the place at which they were collected. I had never seen the species from the Pacific coast, and in July, 1917, I improved an opportunity to collect closely for a couple of hours at Santa Barbara, endeavoring to confirm the occurrence of the species. I was entirely unsuccessful, and am obliged to conclude that the label is probably erroneous, as I think is also the one which would represent a female of *evermanni* as occurring on "Summit of Sierras." That such mistakes can easily occur when collections from several places stand unlabeled for a time is also illustrated by one of my 1917 specimens of *separata*, which I find labeled Jacumba Springs, Cal., about 100 miles inland from San Diego, where I collected the day before my arrival at the coast.

Zetterstedt, Ins. Lapp., 722, 723, 1838 (*Scatomyza fucorum* and *muscaformis*); Dipt. Scand., v, 1982 (*Scatomyza*) viii, 3293, 1849 (*Aricia brunnea*).

Stæger, Grœnl. Antliater. 366, 1845, oc. in Greenland (*Scatophaga*).

Schiner, Fauna Austr., ii, 15, 1864.

Boheman, Kong. Vet. Akad. Forhandl., xxii, 572 (*Scatomyza hyperborca*).

Meade, Ent. Mo. Mag., 1899, 219.

Lundbeck, Dipt. Grœnl., ii, 291, 1900, oc. in Greenland, with fig.

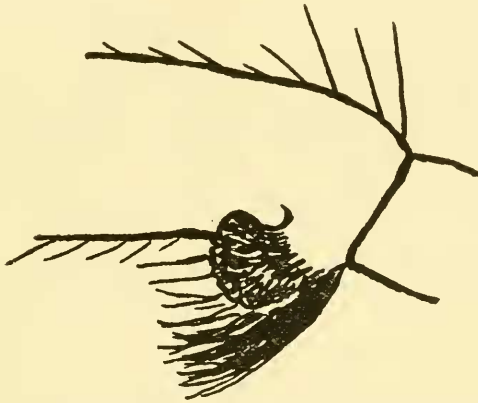


Fig. 4. *Fucellia fucorum*, inner side of base of hind femur, male.

Pandellé, Rev. Ent. France, xix, 270, 1900 (*Chortophila*).

Coquillett, Dipt. of Commander Islands (The Fur Seals, etc., 1899, pt. iv, p. 344), oc. on Commander Islands; Proc. Wash. Acad. Sci., ii, 1900, 453, oc. Sitka, Kukak Bay, Popof Island, and Saldovia, all in Alaska.

Stein, Wien. Ent. Zeit., xxix, 16, 1910, full discussion.—Seacoast of northern Europe, rare as far south as Germany; Bering Straits; St. Paul Island; Friday Harbor, Wash.

Johnson, Psyche, xvii, 76, 1910, not seen from east coast of North America; must be limited to the far north.

This species was not satisfactorily separated from *maritima* until Stein's 1910 paper, and the latter was generally named *fucorum* in collections until that time; hence we have several references in our literature to *fucorum* occurring in Georgia, Porto Rico, New Jersey, and Florida, now believed to refer to *maritima*.

Fucorum possesses the generic characters given above for *maritima*, as well as most of the specific characters of that species. The general color is darker; the palpi and legs are wholly black and the front dark brown; front wider, almost half the head; parafacials wider, and with a changeable dark pollinose spot beside the base of antenna; vibrissæ higher above lower edge of head; bucca wider, about $\frac{2}{3}$ the eye-height; middle tibia with a seta on inner front side, one or two on outer front, and two on outer hind side; middle femur with an even row of about 12 short bristles along upper front side; hind femur of male with a basal meso-ventral protuberance which is slightly enlarged at tip and bears very minute spines; just laterad of it is a tuft of larger stout hairs or small bristles. Hypopygium small; a male from Douglas, Alaska, shows the parts somewhat protruded; in this the second segment of the hypopygium has a deep median groove behind, dividing it into two lobes; the lateral lobe of the fifth sternite is angular and slightly notched mesially near its base, the median emargination of the sternite yellow, with a small yellow point in the center. In a Friday Harbor specimen the emargination and point are brown, the rest retracted.

Length 4.3 to 6 mm.

Forty-five specimens, both sexes; eight from Douglas, Alaska (Eldred Jenne); 27 from Vashon Island, Wash. (Melander); one from Seattle, Wash. (O. B. Johnson); one from Tokeland, Wash. (R. W. Doane); and eight from Friday Harbor, Wash. (Aldrich).

I have also seen a long series collected at Kodiak Island and Katmai, Alaska, by Professor Hine in 1917.

3. *Fucellia costalis* Stein

(Fig. 5)

Stein, Wiener Ent. Zeitung, xxix, 21, 1910.—Monterey, Cal.

Cole, First Report Laguna Marine Laboratory, p. 156, 1912. oc. at Laguna, Cal., and notes.

Male: Front black with thin brown pollen, as wide at vertex as one eye, narrower toward antennæ; two verticals, one ocellar, two small behind ocelli, three frontals curving outwardly, five smaller below curving to the middle; lower part of the narrow parafrontal with a few small hairs in a row; parafacial and bucca silvery pollinose, the former $\frac{3}{4}$ as wide as the length of the third antennal joint, the latter $\frac{2}{5}$ as high as the eye and bearing one row of bristles at lower edge; antennæ black, third joint $1\frac{1}{2}$ times the second and rather tapering, arista thickened on basal fourth; vibrissæ rather high above lower edge of head; palpi black; proboscis short, black, fleshy; back of head with numerous black hairs, the occiput however conspicuously bare.

Thorax as in *maritima* except that the acrostichals are small and irregular, some outside the two rows, and the dorsal surface is quite generally covered with small hairs among the bristles, not present in *maritima*; prescutellars distinct; prothoracic three, mesopleura hairy ex-

cept behind the spiracle, several bristles below the latter; calypters white, the upper edge of the hind one projecting a little; lower part of sternopleura with coarse, abundant bristles.

Abdomen tessellated, with rather distinct median black stripe; first segment almost as long as the next two; a fifth segment visible dorsally as a narrow edge before the hypopygium. Hypopygium of moderate size, the first segment densely set with straight spiny bristles; fifth sternite with a long brown lobe each side of the excision.

Legs entirely black; front tibia with one seta in front, one or two slender on hind side; middle tibia with one on outer front, two on outer hind side; middle femur with the hind lower row becoming short and comblike near tip; hind tibia with three on hind (extensor), three on outer hind, four on outer front side; hind basitarsus with a conspicuous stout spine on lower surface near base; front and middle coxæ very bristly; pulvilli all enlarged and elongated.

Wing subhyaline; beginning at apex of auxiliary the costa bears seven or eight stout setæ, much larger than in the other species, diminishing toward the end of the series (fig. 6).

Length 6.8 to 7 mm.

Female: Front wider, $1\frac{1}{3}$ times as wide as one eye; width of parafacial equal to length of third antennal joint; bucca fully half the eye-height; acr rather distinctly four-rowed; anterior tibia with one in front and two

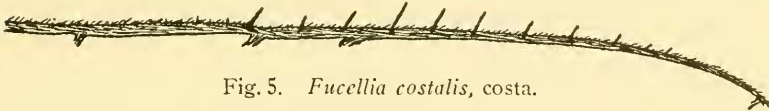


Fig. 5. *Fucellia costalis*, costa.

stout on outer hind side; middle femur with only hairs in place of comb; mid tibia with one or two small on inner front side; one large on outer front, two or three irregularly placed on outer hind; hind basitarsus as in male; pulvilli not enlarged.

Length 7 to 7.8 mm.

Twenty-three specimens of both sexes; two from Laguna, Cal. (Cole); 20 from San Diego, Cal., June 29, 1917; and one from Santa Barbara, Cal., July 6, 1917.

The largest species of the genus. Cole (loc. cit.) says of it: "This species is quite common on decaying kelp. They are large, quick flies. They seem to be at least partially predaceous in habit, as I have seen them pounce upon weakened sandhoppers and by their numbers soon overcome them."

4. *Fucellia pictipennis* Beck.

Becker, Meddel. om Grønland, xxix, appendix, 411.—East Greenland.

Neilsen, *ibid.*, xliii, 32, oc. in N. E. Greenland, lat. $76^{\circ} 46'$.

Stein, Wien. Ent. Zeit., xxix, 26, types redesc.—Hecla Havn, East Greenland.

Johnson, Psyche, xvii, 76, note.

Male: General color deep black, with thin light-gray pollen; frontals five, the two upper turning out, the rest inward; antennæ notably large and broad, reaching the oral margin, which is not much above lower edge of head; bucca almost as high as the eye, bare except the usual row below; back of head bulging, nearly bare; palpi black, long and broad; proboscis short; one pair cruciate bristles on front, one pair ocellars and two small behind; arista short, thick at base.

Thorax with two or three pairs of ant. acr. no hairs among them; chætotaxy as in *maritima* (prealar not noted); stpl 2-2, but the lower ones hardly more than hairs, especially the hind one; calypter small with dark rim but pale fringe, hind calypter very small; halteres sordid dark yellow, almost brown.

Abdomen showing five segments above, the first elongated, the fifth very narrow; hypopygium not very large; fifth sternite black, the lobes long, black, with a few long bristles on outer edge.

Legs entirely black; front tibia with one seta on front (extensor) and one on outer hind side; middle tibia with two on outer front, two on outer hind, and one on inner hind side; hind tibia with the usual three erect long ones on hind (extensor), the outer hind with two near middle and some coarse hairs above and below; hind femora without a protuberance but with a row of 12 bristles below, beginning at second third.

Wing whitish, apical half blackened, less so behind; first vein thick and black at apex, crossveins black, costa with almost imperceptible setules.

Female: Palpi decidedly broadened toward tip, somewhat as in *Lispa uliginosa* Fall., but black.

Length 3 mm.

Eleven specimens, both sexes, Bernard Harbor, Northwest Territory, Canada, collected by the Canadian Arctic Expedition. I saw this material in the Illinois State Laboratory of Natural History, where it had been identified by Mr. Malloch, who called my attention to it. It is to be deposited in the Canadian National Collection in Ottawa. A single specimen in the Carnegie Museum, Pittsburgh, is labeled, "82° n. Lat. On the Beach at n. e. extremity of L. Hazen in the interior of Grant Land. June 7, 1908. Peary Arctic Exped." It was collected by J. W. Goodsell, surgeon, along with two specimens of *Phormia terra-novæ* RD., which bear the same label, and are also in the Carnegie Museum. This record is probably as far north as any fly has been collected. I have mentioned it in *Psyche*, xxv, 33.

5. *Fucellia rufitibia* Stein.

(Fig. 6)

Stein, Wien. Ent. Zeit., xxix, 25, 1910.—Pacific Grove, Cal.

Cole, First Report Laguna Marine Laboratory, 1912, p. 156, note and full-page figure.—Laguna, Cal.

This Pacific species is very closely similar to *maritima* of the Atlantic coast; it is easily separated in the male sex, but pretty close attention is required to distinguish the females, except by the locality labels.

Male: Compared with *maritima*, the male of *rufitibia* has black or blackish palpi instead of yellow; the bucca is more than half the eye-height; the hind femur has no protuberance on the under inner side at base; the middle femur has a long bristle below at middle and one nearer base, whereas there is none in *maritima*; the second, third and fourth abdominal segments are shortened (retracted) so much that they are together usually not much longer than the first segment; and the hypopygium is very much larger and more globose. Among these characters, the

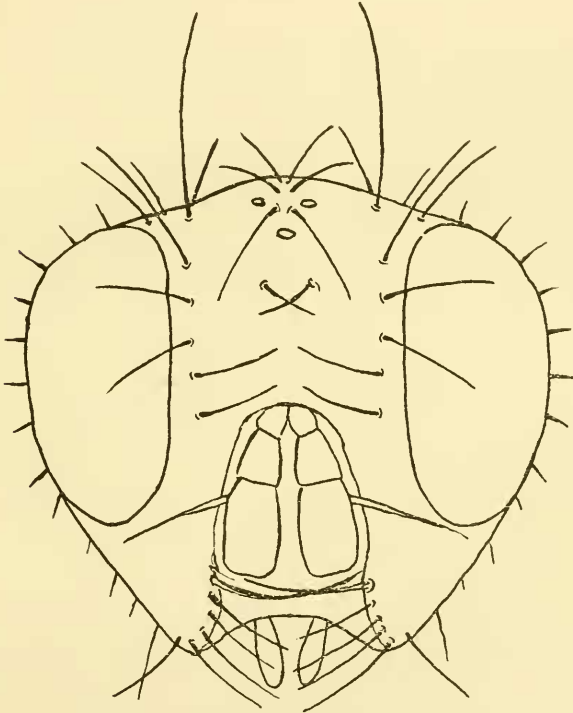


Fig. 6. *Fucellia rufitibia*, front view of head in female.

color of the palpi and the absence of the hind femoral tubercle are ample to distinguish the species. The forceps are difficult to draw out, but are found to be very slender and nearly straight, shining black, more like needles than hooks.

Female: This sex is distinguished from *maritima* by the palpi, bucca and middle femur, being as in the male; the setules of the costa are longer than in the Atlantic species, and this is also true in the male.

Length 3 to 4 mm., noticeably less than in *maritima*.

Forty-five specimens, both sexes; Pacific Grove, Santa Barbara, Laguna, Santa Monica, Long Beach and San Diego, Cal.;

two Laguna specimens are from F. R. Cole, and two Santa Barbara are marked "Dyar", but I have had them many years. I collected all the rest, including some at Santa Barbara. Dates of collection are of almost no significance.

The species occurs in swarms on the castup seaweed of the California seashore; I have had several thousands in my net at once. It is the most abundant of the shore flies.

6. *Fucellia separata* Stein.

Stein, Wien. Ent. Zeit., xxix, 24, 1910.—Monterey, Cal., and Seattle, Wash.

Male and female: General ground color dark brown, with gray-brown pollen. Front over one-third the width of the head, yellow above antennæ, bristles as in *maritima*; antennæ black, small, third joint only a little longer than second, arista short, a little thickened on basal third; parafacial yellow-pollinose, narrow but very short on account of the peculiar shape of the eye, which has its longest diameter almost lengthwise of the insect and is short vertically, leaving a broad, yellow-pollinose bucca as high as it is; vibrissæ high above lower edge of head; palpi black, sometimes dark yellow at base; proboscis small, black; back of head bulging and nearly bare.

Thorax brown, opaque, a lighter pollinose streak from the inner part of humerus back to root of wing, and a pale spot on side just below humerus; chaetotaxy as in *maritima*, but with a few small, distinct hairs bordering the humerus and suture and behind the latter, and stpl only 1-1; calypters pale yellow, rim and fringe concolorous; halteres yellow.

Abdomen a little tessellated, in the female with no special characters; in the male the hypopygium is large, the fourth segment wide and declivous, the fourth sternite strikingly large, prominent but bare; first segment of hypopygium dull brown, with numerous spiny hairs on hind part; second segment concolorous, concave in profile to a bifurcated hump just before the anus; forceps dark yellow, wide, flat, and arched toward the median line.

Front tibia with one seta on front, generally one small on outer hind side; middle tibia with one on outer front, one on outer hind, and in the female there are also one or two each on inner front and inner hind, which are generally absent in male; hind tibia with two on hind, two on outer hind, three on outer front; middle femur in male with a row of small bristles on lower front edge, showing but slightly in female; hind femora plain in male, with row of bristles on outer upper edge in both sexes, and one smaller on lower outer edge in male, which is but little developed in female.

Wing subhyaline, costal spine rather distinct, other costal setules present but small.

Length 4 to 4½ mm.

One hundred specimens, both sexes; 65 collected by myself at Pacific Grove, Santa Barbara, Long Beach, and San Diego, Cal., and 35 by Professor Melander at Ilwaco, Wash., in 1917.

This is the second species in abundance on the California coast, ranking next to *rufitibia*.

7. *Fucellia rejecta*, new species

Female: Black in ground color, but with legs, wing veins, and most of the head yellow. Front almost half as wide as head, decidedly prominent above antennæ, bristles as in *maritima*; parafrontals brown above, yellow below their middle; frontal stripe reddish, with an interrupted blackish crescent anteriorly, beyond which it is yellow to the antennæ; parafacials and bucca yellow, with yellowish pollen, the former wider than usual, the latter almost as wide as eye-height; eye almost perfectly round; antennæ dark yellow, third joint except the base dark brown, arista brown, thickened almost halfway, pale in middle; palpi yellow, proboscis black; back of head black in ground color above, yellow below, bulging, with few hairs, those of metacephalon long.

Thorax with same chaetotaxy as *maritima*, but the post dc might be counted as four, since the coarse hair behind the third is here fully half as long as the latter; between and above the front coxæ is a keystone-shaped sclerite with a notch above, into which fits a rather striking, small shining red sclerite; calypters white, rim and fringe concolorous; halteres yellow.

Abdomen slightly tessellated, with an indefinite median dark stripe which disappears at some angles of view; fourth segment yellow on apical third.

Legs yellow, including tarsi as much as halfway, but the latter are darkened by the usual small hairs; front and hind femora slightly infuscated at base; front coxæ yellowish, the others black in ground color; front tibia with one strong seta on front and one on outer hind side; middle tibia with one (large) on outer front, 3 irregularly placed on outer hind; hind tibia with three on hind (the third nearly one-third as long as the tibia), four on outer hind, and two on outer front; middle femur with four scattered bristles on lower hind edge; hind femur with a row above and 6 or 7 below on outer side.

Wings hyaline, veins yellow, third more brown; costal spines small, the usual scutules of the genus almost imperceptible.

Length 7 mm.

One female, Ocean Beach, a suburb of San Diego, Cal., June 28, 1917. Type in U. S. National Museum.

I do not hesitate to describe this well-marked species from a single specimen, as it is not rare where the type was obtained. I saw several specimens, distinguishing them readily at several feet by their pale color; but on account of their activity and wildness, I succeeded in capturing but one in the time at my disposal. It is not unlikely that the males have somewhat darker femora, judging from the slight infuscation at the base of the front and hind femora in the type.

The nearest ally of *rejecta* is perhaps *funifera* Stein (W. E. Z., xxix, 22) of Chile and Peru; it has yellow legs, but the parafacials are hairy, and the scutellum has hairs on the disk and lacks the usual pair of discals. *Funifera* is the only species of the genus known from the west American coast south of San Diego.

8. *Fucellia antennata* Stein.

(Fig. 7)

Stein, Wiener Ent. Zeit., xxix, 23, 1910.—Sitka, St. Paul Island, and Karluk, Alaska.

Male and female: Black with opaque gray pollen, which has a glaucous or bluish cast. Front in male, .483, in female .515 of head width (one of each sex); frontal stripe brown, with brown pollen; bristles of head as in *maritima*, but only two lower, incurved frontals; antennæ black, the third joint distinctly longer and wider than in other species, reaching almost to the vibrissæ; parafacials rather narrow, bucca almost as high as the eye, which is nearly round; facial ridges yellowish, pollen of bucca smooth and gray; palpi black, ordinary; proboscis black, small; back of head bulging, with scattering hair.

Thorax with same chaetotaxy as in *maritima*, except that the scutellum has only a single very distinct row of hairs well down on the edge; prealar distinct, but only a third as long as supraalar; behind the suture are only a few hairs laterally; the pale spot below the humerus is indistinct; lower stpls very small; calypters pale, rim and rather heavy fringe concolorous; halteres yellow.

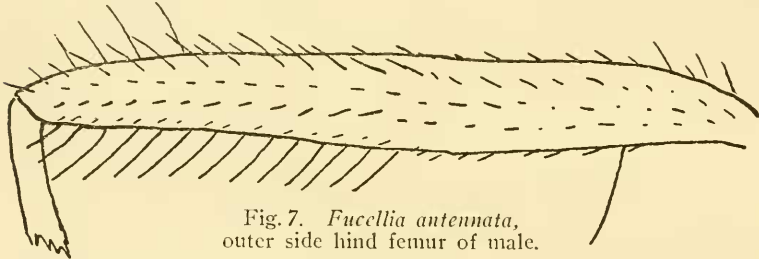


Fig. 7. *Fucellia antennata*,
outer side hind femur of male.

Abdomen hardly tessellated, of ordinary structure; in the female the fourth segment longer than the preceding; male hypopygium of moderate size, black; fifth sternite rather erect, with large lateral lobes forming more than half a circle, within them a deep cavity, in the single specimen; second and third tergites together in male longer than first, fifth tergite not visible.

Legs black, trochanters reddish; front tibia with one seta in front; middle tibia with one on outer front, one on outer hind, on inner front the male has one, the female two; hind tibia with three behind, four on outer hind, female has two on outer front which are absent in male; middle femur with erect row of about 7 small slender bristles on hind side below, stopping just beyond middle, the same in both sexes; hind femur with usual row above in both sexes, in the male a very characteristic row of about 13 on lower outer edge, beginning before the middle, very straight and even and close together; the last in the female are fewer, only about 7, and ordinary in appearance.

Wing hyaline, costal spines and setules very minute.

Length, of male $3\frac{1}{2}$ mm.; of female, 5 mm.

Twenty specimens, both sexes; five from Douglas, Alaska, August, 1901 (Eldred Jenne); one from Katmai, Alaska, in 1917 (Hine); 13 from Ilwaco, Wash., in May and July, 1917 (Melander); and one from Tacoma, Wash.

9. *Fucellia evermanni*, new species

(Fig. 8)

Male: Opaque, gray-brown species; front .463 of head-width (in the type), rather short and bulging; bristles of head as in *maritima*, except that there is uniformly a second pair of cruciate frontals, slightly smaller than the usual ones and standing about twice as far apart below them; antennæ small, black, second joint reddish on front side, third only as long as second, arista short, shining black on the enlarged basal fifth; parafacials opaque gray, front edge and down along facial ridge reddish; bucca opaque gray, almost as high as the eye, which is small, roundish, slightly elongated obliquely; palpi dark yellow, their tips a little infuscated; pro-

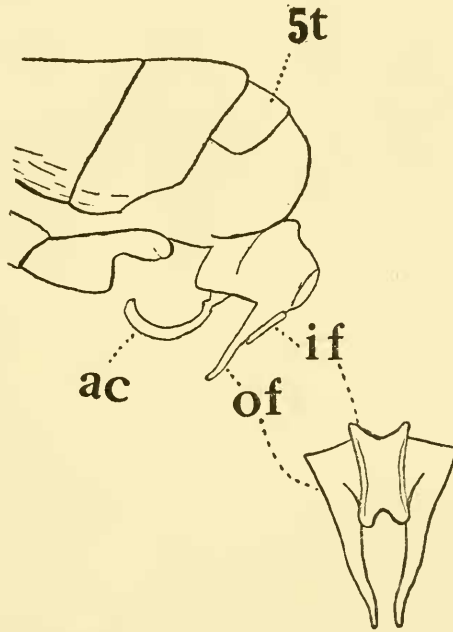


Fig. 8. *Fucellia evermanni*, side view of hinder part of male abdomen with genitalia drawn out, together with posterior view of the forceps.

5t, fifth tergite.

if, inner forceps.

of, outer forceps.

ac, anterior clasper. (Penis and posterior claspers not shown.)

boscis short, black; back of head very bulging, with rather coarse and numerous black hairs.

Thorax opaque gray with slight traces of brown pollinose spots above; chaetotaxy as in *maritima*, except as follows: in the ant dc rows and laterad of them are some noticeable hairs, and there are hairs on the disk of the scutellum, as well as rather plentifully behind the suture; prealar and lower hind stpl absent. Calypters white with yellow rim and long, whitish fringe; halteres pure yellow.

Abdomen smooth, sub-opaque, dark gray, with slightly silky surface, rather long and with parallel sides; second, third, and fourth segments of equal length, each more than half the first; the hairs on hind edge are longer and more numerous on each succeeding segment, very striking on the last, yet so slender as hardly to be called bristles; fifth tergite conspicuous, half as wide in middle as the preceding, unsymmetrical in shape, its left end shortened and exposed, the right passing out of sight under the preceding segment; its hind part bearing long, rather appressed hair; first segment of hypopygium rather large, with the same hair; second segment large but more or less folded in out of sight, its hind part bearing an unsymmetrical black hump or protuberance to the right of the middle; a fringe of black hairs around the nearly circular anal space; the inner forceps forming an oblong plate with only short projecting anterior outer angles; outer forceps shining yellow to brown, very slender and nearly straight, far apart at base but approaching apically, the tips slightly turned up; anterior claspers a little larger than the outer forceps, shining yellow, strongly curved forward, widened near apex; fifth sternite broadly shining black in middle, the sides opaque, both parts hairy, lobes with longer hair; fourth sternite large, prominent, hairy.

Legs entirely black; front tibia with one bristle in front; middle tibia with two on outer front, two on outer hind, one on inner hind side; hind tibia with three behind (the middle one long and tapering), three on outer hind, four on outer front; middle femur with row of small bristles on lower front edge and another a little larger but still small on lower hind edge; outer side of hind femur with the usual row above, and a row of about a dozen below, beginning near base. Claws large, pulvilli hardly enlarged. Hind basitarsus without spine below.

Wings uniformly subinfuscated, veins heavy and dark; costa broken at tip of first vein, which is pale for a short distance; first vein almost white for a section near its middle, thence to apex heavy and black; some indistinct pale markings around the basal crossveins; costal spines very minute, no setules before or beyond them.

Female: Front .461 of head-width (in allotype); ant aer in the middle of the series coarser than in male; middle tibia with two on inner front, none on inner hind, two on outer front, two on outer hind; middle femur with the bristles on lower front edge larger than in male, second segment of abdomen shortest, fourth narrowing almost to a point, and bearing at hind edge both above and below a close row of stout, appressed bristles, about 16 above and 12 below; other abdominal bristles inconspicuous; lateral and lower surface of abdominal tergites and whole of sternites covered with short, erect, spiny hairs of an unusual character. The rest as in male.

Length $5\frac{1}{2}$ to $6\frac{1}{2}$ mm.

Twelve males and four females, collected by Dr. Barton Warren Evermann, Director of the Museum of the California Academy of Sciences, for whom the species is named, on the Farallon Islands off the Golden Gate, on July 6, 1917. "This kelp-fly is excessively abundant on the Farallon Islands. On July 6 and again on August 6, 1917, when I visited Southeast Farallon Island, these flies simply swarmed by hundreds of millions on and about the bird rookeries, particularly on the areas where Brandt's cormorants were nesting. One could not move about these rookeries without being constantly covered and surrounded by myriads of these pestiferous little flies." (Evermann.) One female from the Museum of Comparative

Zoology, Cambridge, Mass., bearing the label, "Summit Sierra Nevada, July 17. O. Sack," in Osten Sacken's handwriting. This locality, so far from the seashore and elevated about 7000 feet above it, seems almost incredible for a *Fucellia*; it agrees, however, with Osten Sacken's statement on the first page of his "Western Diptera", that he spent two weeks in July, 1876, in collecting about Webber Lake in the Sierras, this lake being near the summit north of the Southern Pacific railroad. Whether he did not accidentally incorporate a seacoast specimen with his summit material is the question.

Type and paratypes in Museum of California Academy of Sciences; paratypes in U. S. National Museum.

See notes on relationship under *Fucellia bicrucata* Stein.

10. *Fucellia bicrucata* Stein.

Stein, Wien. Ent. Zeit., xxix, 20.—Miednaja, Bering Straits.

"Front very broad, above the antennæ at least twice as broad as one eye at the same level, with two pairs of cruciate bristles, one pair close behind the other, equally strong and equally far apart, in front of which is still a third pair which stand farther apart. The projecting part of the front is in profile completely convex. Bucca very wide, fully equal to the eye-height; back of the head very bulging. Antennæ shorter than the face, third joint hardly longer than the reddish second, arista thickened on the basal fourth. Palpi black and bristly, quite stout. Thorax colored and marked as in *fucorum*, acr in two rows, anteriorly with small, scattered hairs between them; prealar entirely wanting, stpl two in front, one behind, below the latter no trace of a small bristle. Scutellum on its upper surface more bristly than in the other species. Abdomen of the usual color, apparently with a median narrow dark stripe. Legs black, claws somewhat elongated, pulvilli short. Front tibia without a bristle on the side away from the body, only ciliated with fine hairs; middle tibia with two on outer front, one on outer hind, three on inner front, the last on the apical half, short but strong; hind femur on the lower outer edge with about 8 bristles in the whole length, hind tibia with the usual bristles. Wings dirty yellowish-gray, the base with whitish spots, all the veins strong, especially the last third of the first vein, which is whitish just before this part. Costal spine very small, no setules visible, both crossveins feebly infuscated. Calypters very small, whitish with yellowish border, halteres yellow.

"Length about 8 mm.

"The two specimens before me, which seem to be females, are from Mr. Becker's collection and were taken at Miednaja on Bering Straits."

The above is a translation of the entire description. I have seen no specimens agreeing with it in regard to the cruciate bristles. It may be inferred that the type specimens were not in good condition, as Stein was not sure of the sex. In many details *evermanni* agrees, and must be a near relative, but has so many strong characters not mentioned by Stein that it would

be assuming far too much to identify it as *bicrucciata*, to say nothing of the thousands of miles of coast line between the Farallon Islands and Bering Straits which has so far yielded nothing to connect the species.

Whether *Miednaja* is on the Asiatic or the North American side of the Straits I have been unable to find out.

11. *Fucellia ariciiformis* Holmg.

(Fig. 9)

Holmgren, Kongl. Ventesk. Förhandl., 1872, 103 (Scatophaga).—North Greenland.

Lundbeck, Dipt. Grœnl., ii, 292, fig. (Vidensk. Medd.,

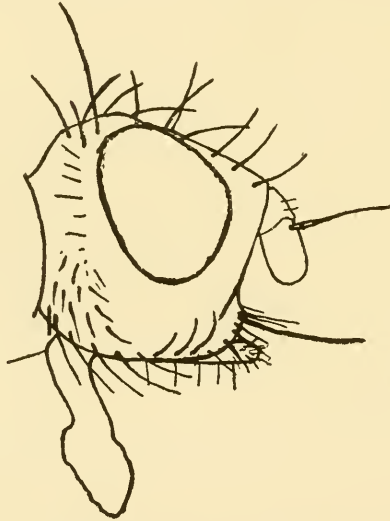


Fig. 9. *Fucellia ariciiformis*, head in profile, male.

1900).—Several places on Greenland coast, bred from seaweed.

Stein, Wien. Ent. Zeit., xxix, 19, 1910, redesc. from Lundbeck's material; Arch. f. Naturgesch., lxxix, 44, female in table, 1913.

Johnson, Psyche, xvii, 77, 1910.

Male: Opaque dark gray, with three indistinct brown thoracic stripes. Front prominent, .451 of head-width in the described male; face receding more than usual; bristles of head as in *maritima* but generally longer, especially the two pairs behind the ocelli; parafacials and bucca dark gray, the latter fully half as high as the eye, with long bristles below; antennæ

black, standing out prominently, second joint about half as long as third, arista black, penultimate segment distinct, thickened for nearly a third of last segment, beyond with minute, microscopic pubescence; palpi black, with long bristles below; proboscis short, black; back of head bulging, with a few rather long hairs.

Thorax opaque dark gray, with an indistinct brown stripe on the acr, one each side on the dc, and behind the suture a short one on the intraalars; chaetotaxy as in *maritima*, but there are a few quite long hairs in the dc rows, about the humeri, and laterally behind the suture; the hind postalar is notably long; calypters dirty, whitish, rim and fringe indistinctly brownish; halteres rather dark yellow.

Abdomen rather long, with parallel sides; second, third and fourth segments subequal, not much shorter than the first; a distinct fifth tergite shows about $\frac{1}{4}$ the length of the preceding one; hypopygium rather small, its first segment with numerous smallish bristles directed backward, second much imbedded, when viewed from behind showing a decided notch posterior to the anal area; fifth sternite not in good condition in the described specimen, but with long hairs on the sides; the preceding sternites inconspicuous.

Legs wholly black, with long bristles; front tibia with one in front and one on outer hind side; middle tibia with one on outer front, two on inner front, one on outer hind, and two on inner hind but not far out of line with the last preceding; hind tibia with three behind, four on outer hind and four on outer front side. Middle femur with about four long scattered bristles on lower front edge and a row on lower hind which are long near the middle, but shorter and slanting toward tip; hind femur with the usual upper outer row, and a lower outer one of about 8 long ones, beginning near base; hind femur at base below with a tuft of small spines situated upon a slight elevation; hind basitarsus with a spine below. Pulvilli and claws small.

Wings slightly and uniformly infuscated; veins blackish, crossveins not bordered; spines and setules distinct but small.

Female: Parafacial and bucca wider (or eye smaller); bucca over half the eye-height, with very long bristles below; the specimen has four decussate lower frontals, instead of three as in male; abdomen without any striking bristles, the second and third segments shorter than the first and fourth; tibial bristles same as in male; middle and hind femora as in male, except that the latter lacks the spinous elevation on the base below.

Length $4\frac{1}{2}$ to 5 mm.

One male, one female. St. Paul Island, Bering Sea, August 16, 1915, in the collection of the U. S. Biological Survey; the Survey has a series taken at the same time and place which I have not seen; they were determined by Mr. Malloch. I have seen a series of 25 specimens, taken by the Canadian Arctic Expedition at Bernard Harbor, Northwest Territory, Canada; these are the property of the Canadian National Collection, and were also determined by Mr. Malloch.

Stein places some stress upon the bloodred color of the halteres in both sexes, but I think it a variable character in dried specimens, and it does not occur in what I have seen, although they run to *ariciiformis* in both sexes in Stein's tables. Existing descriptions say very little about the chaetotaxy.

12. *Fucellia æstuum*, new species

Male: Very much like *maritima*, but the tibiæ black and the hind femora plain. Front .426 of head-width (one specimen), brown, very little paler at front edge; bristles as in *maritima*; antennæ black, third joint less than twice the second, arista bare, enlarged for a third its length; parafacials and bucca gray, the former rather narrow and with a changeable spot opposite antenna, the latter half the eye-height; palpi dark yellow, the apical third blackish; proboscis black, small; back of head only moderately bulging.

Thorax unicolorous dark gray above, a shade lighter on sides; ant acr three stout pairs, no small scattered hairs before the suture, and only four to six behind it; prealar distinct but less than half as long as the bristle behind it; rest of thoracic characters as in *maritima*.

Abdomen with thin brown, changeable pollen, giving a tessellated effect, in some lights showing a broad median dark stripe; bristles inconspicuous; fifth segment indistinctly marked off from the first of the hypopygium, which is small and bears numerous bristles behind; second of hypopygium small, subshining black, with only small hairs; fifth sternite yellowish brown, suberect, forming with its concolorous lateral lobes a raised rim open behind, the central space hollow to some depth (probably not so in all specimens, this is a single case); the lateral lobes bear only fine hair.

Legs black; front tibia with one bristle on front side; middle tibia with one on outer front, two or three on outer hind; hind tibia with three on hind, four on outer hind, and on outer front side with a row of about 8, smaller above; hind basitarsus with spine below; middle femur with a few scattering bristles below on both front and hind edges, longer behind; hind femur plain, its outer side bearing the usual row of bristles above, while below it has a row of about 7, beginning before the middle.

Wings subhyaline, crossveins not infuscated, costal spines and setules small but visible.

Female: Same as male except as to genital segments. The palpi being red at base is a good character to separate these females from those of *fucorum*, *ariciiformis*, *antennata*, and apparently *hinei*.

Length 4 to 4½ mm.

Fifty specimens, both sexes: 46 (including type) from Ilwaco, Wash., July, 1917 (Melander); two Vancouver, B. C., Aug. 8, 1917 (Melander); one Tokeland, Wash. (Doane), and one Pender Island, B. C. (Aldrich).

Type and paratypes in California Academy of Sciences; sets of paratypes in the United States National Museum, the Canadian National Collection, in Professor Melander's collection, and in that of the writer.

13. *Fucellia hinei*, new species

(Fig. 10)

Entirely black, slender, with globose head, apical half of wing anteriorly with distinct but ill-defined brown tinge.

Male: Front .486 of head width (average of two—.500 and .471); frontals 7, upper 3 inclined outwardly, lower 4 mesially; one large pair

cruciate in the front; ocellars large, with two smaller pairs behind them; front, face, antennæ and palpi entirely black; parafacials at narrowest as wide as third antennal joint, the latter less than twice as long as second joint; bucca over $\frac{1}{2}$ the eye-height; back of head greatly protuberant, with black hairs.

Thorax thinly pollinose, the mesonotum not showing the normal pollen in either specimen; pleuræ with faint white pollen, which becomes dense in a spot just below the humerus at the side; chætotaxy as given for *maritima*, except that the lower hind sternopleural is absent and there are several of different sizes at the anterior end of msn and above front coxa; calypters and fringe nearly white, rim more yellowish; halteres dark yellow, subinfuscated.

Abdomen narrow, black, with thin, dark tessellation; second, third and fourth segments subequal, first longer; hypopygium small and much retracted, wholly black; fifth sternite wholly black, its free and elevated lateral lobes black, infolded.

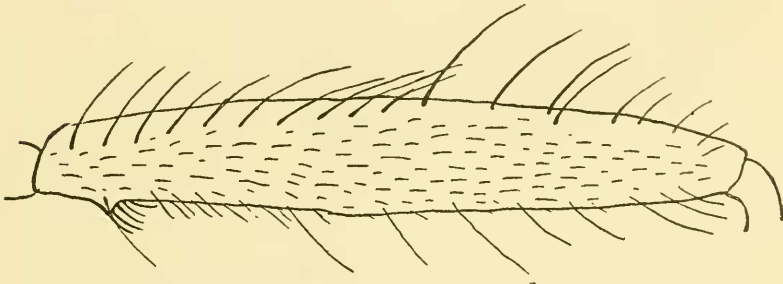


Fig. 10. *Fucellia hinci*, outer side hind femur of male.

Legs wholly black; front tibia with one bristle in front at second third and one on outer side at middle; middle tibia with 2 on outer front, 2 on inner front, 3 on outer hind (of which the upper and lower are almost on inner hind); hind tibia with 3 on hind, 4 on outer hind, 5 on outer front; hind basitarsus with smallish spine below; middle femur with a row of 15 on the whole length of the lower hind edge, and nearly a dozen on lower front edge, of which the stoutest are before the middle; hind femur with the usual upper and lower row on outer side, and at base below with a tuft of four to six small spines, which are variable and sometimes stand on a distinct elevation.

Wings tinged with gray, and marked as stated with a vague brown spot beyond the middle on anterior half; costal spines and setules rather smaller than usual.

Length 5 mm.

Two males, Kodiak Island, Alaska. Collected by Prof. Jas. S. Hine, after whom the species is named. Type and paratype in Professor Hine's collection.